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[54] **RIFLE MODIFICATION**

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[51] **Int. Cl.**[3] **F41D 5/10**
[52] **U.S. Cl.** **89/193**; 89/198
[58] **Field of Search** .... 89/185, 191 R, 193 198; 42/49 A

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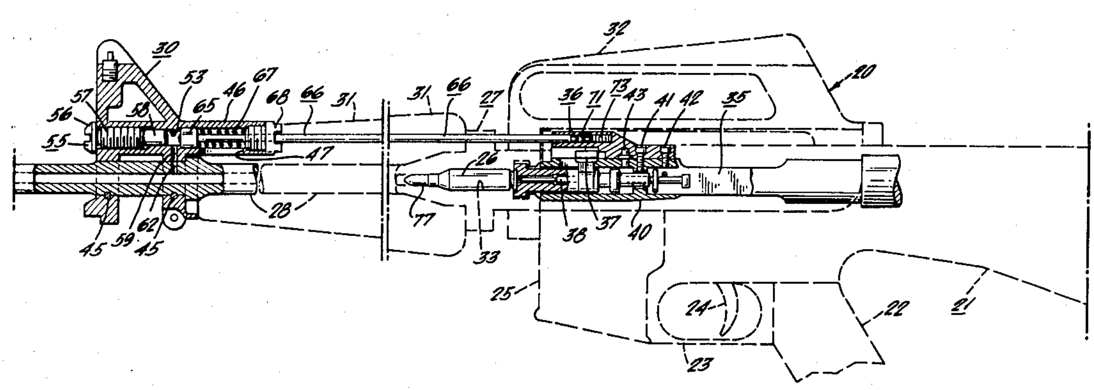
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[57] **ABSTRACT**

A modification for the M-16 U.S. Army rifle wherein the bolt mechanism is activated by mechanical means instead of the present gas means.

1 Claim, 7 Drawing Figures



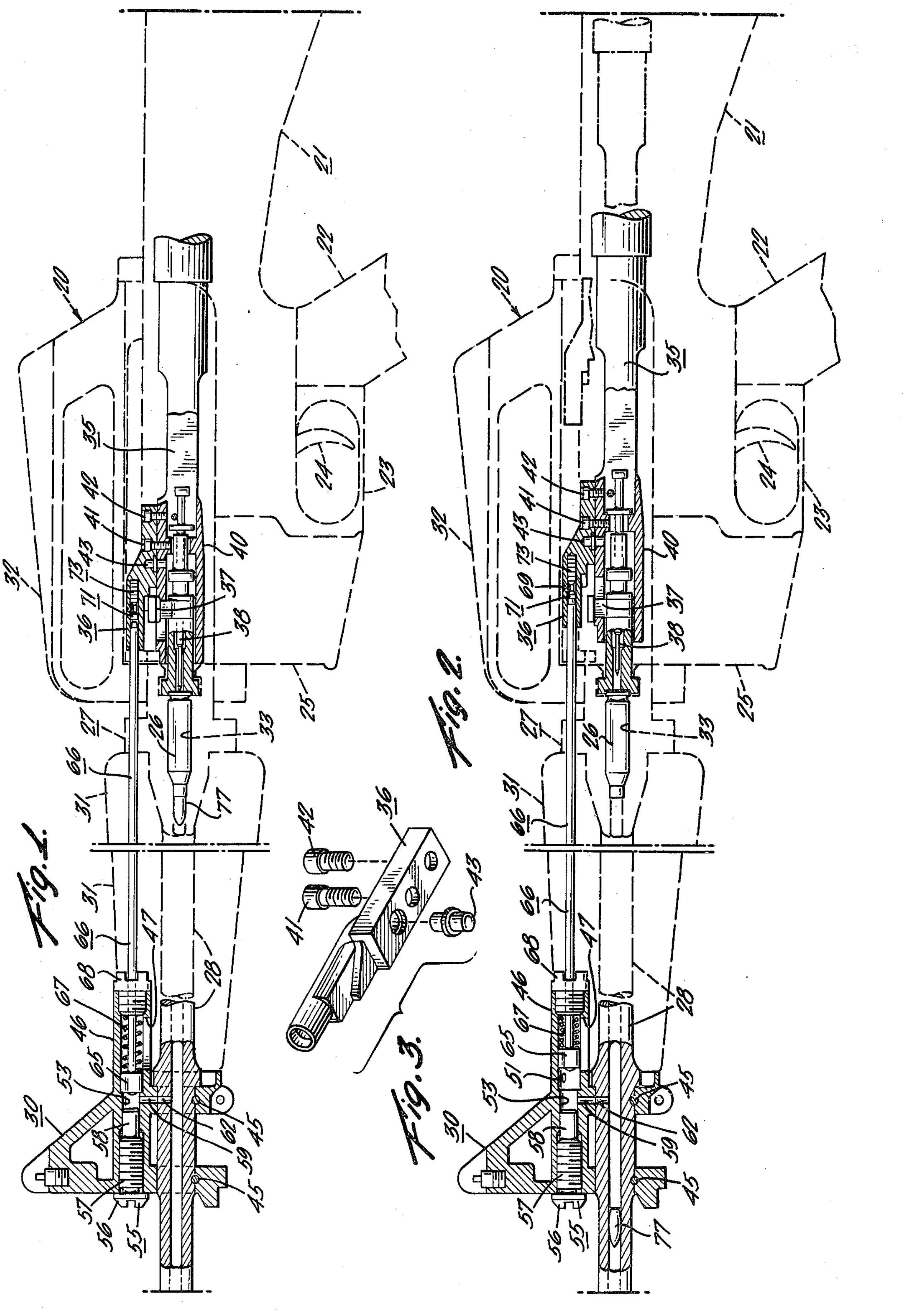


Fig. 1. Fig. 2. Fig. 3.

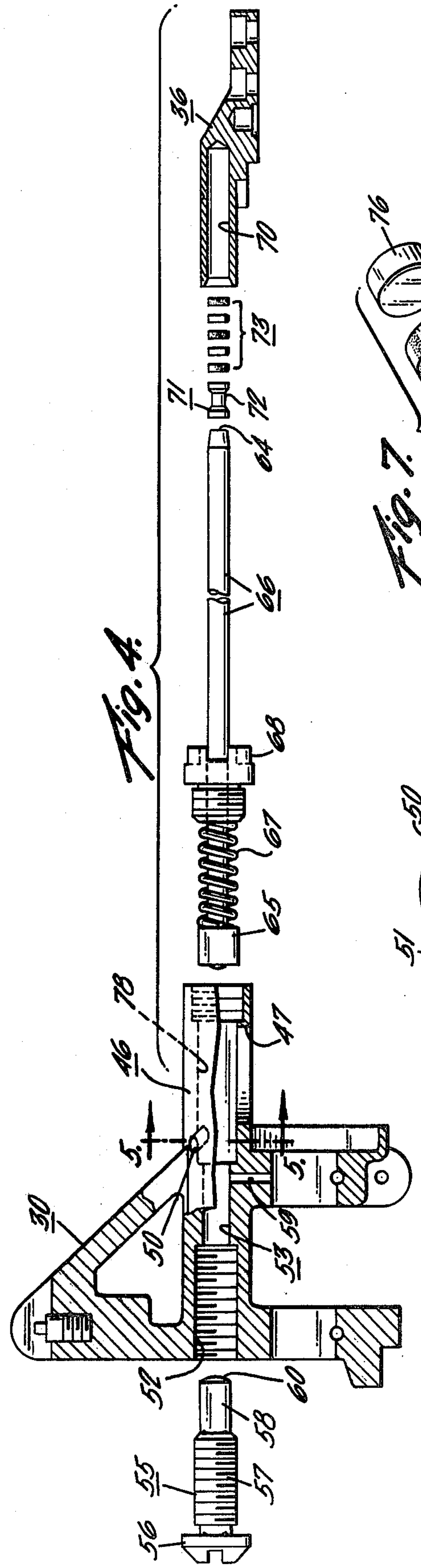


Fig. 4.

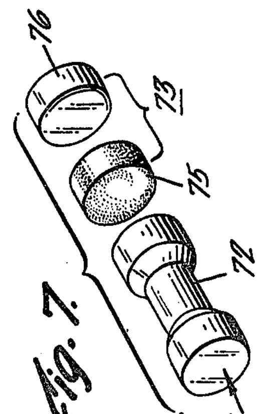


Fig. 7.

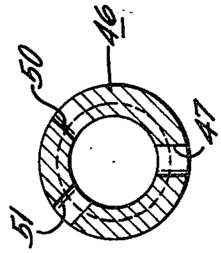


Fig. 5.

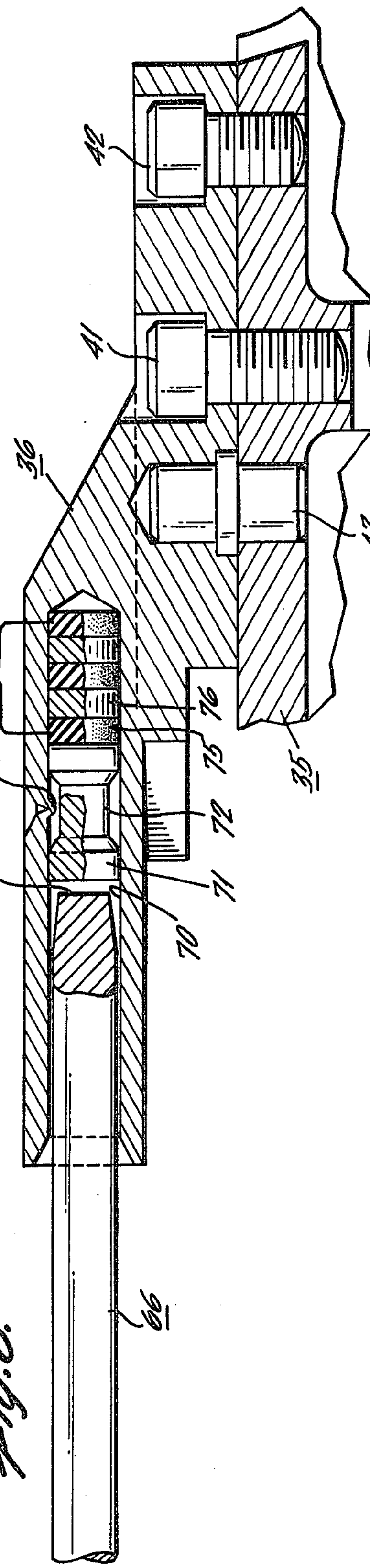


Fig. 6.

RIFLE MODIFICATION

BACKGROUND OF THE INVENTION

The standard U.S. Army rifle is the well known M-16 Colt design rifle. Such rifle is fully described and shown in prior U.S. patents.

The rifle can be operated selectively as a semi-automatic rifle. In either operation, the propellant gases formed in the rifle are used to operate the bolt mechanism whereby the bolt is unlocked and then retracted. During retraction, the spent shell is ejected, and a helically wound spring is compressed. The bolt mechanism is then returned to its forward locked position by the spring.

The bolt is operated by the propellant gasses by tapping these gases in the rifle barrel prior to the bullet's leaving the barrel and by transmitting this gas pressure through an elongated tube extending along the top of the barrel to a position adjacent the bolt mechanism. This gas pressure is then used to move the bolt rearwardly slightly during which action the locking mechanism of the bolt is rotated, permitting the bolt to be forced fully rearwardly by direct action from the gases in the barrel, at which time the spent shell is ejected from the chamber of the rifle. Such action is well known.

PROBLEM OF THE PRIOR ART

In the operation as described above, it is critical that the passageway through which the gas pressure is transmitted from the barrel rearwardly to the vicinity of the bolt be kept open so that adequate pressure can be transmitted. In the M-16 this passageway or orifice extends for approximately 10". The diameter of the orifice is approximately 0.040".

A problem has arisen in the operation of this rifle, in that this passageway, and orifices leading to and away from this passageway, become clogged and blocked with a residue or products of combustion resulting from the ignition of the propellant powder used in the projectile. The problem is particularly acute when the propellant powder includes calcium carbonate. The U.S. Government, in an effort to solve the problem, has set high standards for the propellant powders in an attempt to eliminate the residues, particularly residues from calcium carbonate. However, the problem of obstruction or blockage of the orifice from residues, as well as outside particles, continues to occur, resulting in malfunction of the rifle.

The problem is a particularly serious one since the passageway is much longer than is generally the case in this type of design.

SUMMARY OF THE PRESENT INVENTION

The present invention eliminates the prior art problem of blockage of the passageway from residue in the products of combustion of the propellant, or from foreign particles.

In the present invention the long, relatively small diameter air passageway is eliminated and the force necessary to operate the bolt mechanism is transmitted by mechanical means rather than by the former gas pressure means. The mechanical movement consists essentially of a forward cylinder connected to the front portion of the barrel wherein gas pressure from the propellant powder is introduced. Pressure within the cylinder acts to operate a piston and rod which transmits force rearwardly to the bolt. A buffer arrangement is created between the rearward portion of the piston rod and the bolt key. This buffer arrangement between the piston rod and the bolt key serves to absorb the initial high impact created by the gases in the forward cylinder which is transmitted rearwardly by the piston rod.

The present invention can be used to modify existing rifles wherein the modified parts, suitably in the form of a kit, can be substituted or applied to existing rifles.

Additionally, new rifles can be built with the modifications therein.

The cylinder is suitably vented so that only a portion of the gas pressure is used to operate the recoiling piston rod.

DESCRIPTION OF THE DRAWINGS

FIG. 1 is a side elevational view, in phantom lines, of an M-16 rifle, with the portions of the assembly pertinent to our invention shown in full lines.

FIG. 2 is a view similar to FIG. 1 showing the piston, piston rod, bolt carrier key and bolt assembly, immediately after firing, with the bullet having passed a vertically extending gas port in the front sight assembly.

FIG. 3 is a pictorial view of the bolt carrier key, fasteners and gas port plug and shear pin in exploded related positions, prior to assembly to the bolt.

FIG. 4 is an exploded sectional side elevational view of the component parts of our invention showing the gas cylinder adjustment screw-front sight housing and combined gas chamber with associated ports, piston head, return spring, piston rod, buffer assembly and bolt carrier key.

FIG. 5 is a transverse sectional view, taken on the line 5—5 of FIG. 4, showing the number and angular displacement of exhaust ports.

FIG. 6 is an enlarged fragmentary side elevation section view of the bolt carrier key assembly as shown in FIG. 1.

FIG. 7 is a pictorial view of the bolt carrier key buffer components showing only two of the five disks.

DESCRIPTION OF THE SPECIFIC EMBODIMENT

There is shown in the figures a cut-away portion of a M-16 rifle **20** having therein a stock assembly **21** having integral therewith a pistol grip **22**, trigger housing **23** and trigger **24** and magazine housing **25**, all of the standard prior art design. Forward of the stock is the upper receiver **27** which includes barrel **28**, front sight assembly **30**, hand guards **31**, and top carrier **32**. At the rearward end of the barrel are chamber **33** and bolt **35**, bolt key **36**, cam **37**, firing pin **38** and bolt body **40**.

Bolt key **36**, as best seen in FIG. **3**, is modified from the prior art. The bolt key **36** is secured to the bolt **35** itself by retaining Allen set screws **41** and **42**. The bolt key **36** has suitable holes drilled therein and the bolt **35** itself has tapped holes formed therein so that the said screws **41** and **42** can securely lock the bolt key **36** to the bolt **35**.

A shear pin **43** is inserted between bolt key **36** and bolt **35**, as best seen in FIG. **6**, to both block the prior art gas porthole into the interior of the bolt whereby gas pressure in the prior art was transmitted thereto, and to secure the elements **35** and **36** together.

At the forward end of the barrel **28**, front sight assembly **30** is secured thereto by two tapered dowl pins **45** as

is well known. The front sight assembly **30** of the prior art is modified, as more clearly shown in FIGS. **4** and **5**, to form therein a cylinder **46** having therein a lower longitudinally extending port or slot **47** and upper exhaust ports **50** and **51**. A threaded tapered hole **52** extends through the upper sight to a smooth bore gas chamber **53**. A blocking and adjusting screw **55** having a suitably slotted head **56** and threaded portion **57** integral with a smooth rearward portion **58**, as best seen in FIG. **4**. The end **60** of the adjustment screw **55** serves as a blocking surface for the front end of chamber **53** when screw **55** is threaded into tapered threads **52** as shown in FIGS. **1** and **2**.

There extends a port **59** vertically within the front sight assembly **30** as best seen in FIG. **4**. Such port **59** is for instance approximately ⅛" diameter and connects with port **62** in barrel **28**. The front sight assembly **30** is so aligned and positioned on the barrel so that port **59** and **62** are in exact alignment.

Extending within cylinder **46** is piston **65** integrally connected to rearwardly extending piston rod **66**. Piston **65** is of a suitable diameter to form a sliding fit within cylinder **46**. A helically wound compression spring **67** extends around piston rod **66** and between piston **65** and retaining lock screw **68**, as seen in FIG. **4**.

The rearward end of the piston rod **66** extends into an inner bore **70** formed within bolt key **36**. Piston rod **66** is free to slide within inner bore **70** in a manner to be explained later.

A floating piston **71** having a recessed portion **72**, as best seen in FIG. **7**, extends rearwardly of piston rod **66** within bore **70**, as best seen in FIG. **6**. A retaining dimple **69** formed in bolt key **36** will permit floating piston **71** to move longitudinally within limits, within the bore **70**. Rearwardly of the floating piston **71** there extends a series of abutting shock-absorbing pads **73**. As shown, there extends five (5) pads or disks, desirably of alternating different material such as neoprene pads **75** and steel **76**.

In operation, the M-16 rifle is loaded in the prior art manner wherein a magazine having a plurality of projectiles is inserted into magazine housing **25**. The initial loading of the weapon is done manually by retracting the bolt **35** against the prior art bolt return compression spring, not shown, extending rearwardly longitudinally within the stock assembly **21** of the rifle. The rifle is then in the condition shown in FIG. **1** wherein a projectile **26** is in chamber **33** ready to be fired. The bolt **35** is in a locked position as is well known.

In the modification of the invention, the piston rod **66** and piston **65** are in a forwardmost position under the bias of spring **67**, against the shoulder which is at the rear of the chamber **53**. Adjusting screw **55** is adjusted to provide a suitable fixed volume chamber **53** as seen in FIGS. **1** and **2**, to receive propellant gases from the barrel, as will be later explained in more detail. The rearward end of piston rod **66** is in abutting relationship with floating piston **71** which in turn is in contact with shock-absorbing pads **73**, within bolt key **36**. The end of rod **66** extends in a sliding fit within bore **70** of bolt key **36**.

The length of piston rod **66** and integral piston **61** is such that there is a slight space between the end of piston rod **66** and floating piston **71**, as seen in FIG. **1**. This space could be in the range of 0.030" and 0.040".

The rifle is ready to be fired at this point, as shown in FIG. **1**. Upon firing, the firing pin **38** is released in the well known manner when trigger **24** is pulled, striking the primer in projectile **26**. The propellant gases are ignited and rapidly burned forcing bullet **77** forward. At this point, of course, extremely high pressure is built up by the burning propellant powder. The powders are contained within the barrel **28** as the bullet **77** progresses forwardly. The bullet passes port **62** as is seen in FIG. **2**. A portion of the propellant gases are forced through port **62** through **59** in upper sight assembly **30** into chamber **53**. The pressure in chamber **53** forces piston **65** rearwardly within cylinder bore **78** of cylinder **46**. As the piston rod **66** travels rearwardly, the end **64** of piston rod **66** slams against floating piston **71**, compressing pads **73**, and forcing bolt key **36** rearwardly. Since bolt key **36** is rigidly secured through Allen set screws **41** and **42**, and shear pin **43**, the rearward force exerted by rod **66** is transmitted to bolt **35**. Bolt **35** moves rearwardly, unlocking prior art bolt locking mechanism, which includes cam **37**, in the well known manner. The chamber **33** is then opened wherein the pressure within barrel **28** forces shell **26** rearwardly against the bolt **35** causing the bolt **35** to travel backwardly against bolt return compression spring. This step is the same as that of the prior art. The shell **26** is ejected and the bolt **35** at the end of its rearward travel is forced forwardly again by the bolt return compression spring into the position shown in FIG. **1**, during which time a new projectile is placed into the chamber. Spring **67** returns piston rod **66** into its forward position as shown in FIG. **1**.

The adjustment screw **55** is used to provide a variable volume chamber **53**. The variable volume chamber permits an adjustment whereby varying rates of fire can be acquired, and also compensates for variations in powder charges and chamber pressures. For instance, where chamber pressures are relatively high and powder more quickly burning with resultant high pressure, the chamber is expanded so that less impact is exerted against piston **65**. Where the powders may be more slow burning and chamber pressures lower, the chamber **53** may be reduced involume so that optimum action of the piston rod **66** and bolt **35** can be achieved.

Upper exhaust ports **50** and **51** in cylinder bore **78** are angled forward to prevent propellant gas exhaust from blowing back into the shooter's face. The ports are located forwardmost in cylinder bore **78** to immediately exhaust the gases and relieve gas pressure after the bolt **35** is unlocked. Complete dumping of gas is achieved through elongated slot **47**. Elongated slot **47** also permits the easy self cleansing of cylinder bore **78**.

In the operation as described above, the shell ejection is achieved in a smooth and controlled manner as opposed to the prior art gas ejection which is erratic due to uneven gas pressures which are directly transmitted.

In view of our invention, variations and modifications to meet individual whim or particular need will doubtless become evident to others skilled in the art to obtain all or part of the benefits of our invention without copying the structure shown, and we, therefore, claim all such insofar as they fall within the reasonable spirit and scope of our claims.

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A modification for a M-16 type standard U.S. Army rifle having among its elements a barrel and a bolt with a bolt key secured thereto, comprising:

(a) a forward cylinder connected to the front portion of the bore of the barrel wherein gas pressure from

burning propellant powder is introduced, said cylinder having

(1) adjustment means for varying the size of the bore of the cylinder whereby the force exerted by the propellant gases on the piston rod can be controlled, and

(2) gas exhaust means;

(b) a piston within the cylinder;

(c) a rod connected to the piston extending rearwardly of the cylinder for transmitting force rearwardly to the bolt key; and

(d) a buffer arrangement at the rearward portion of the piston rod and within the bolt key for absorbing the initial high impact force created by the gases in the forward cylinder which is transmitted rearwardly by the piston rod, said buffer system having a floating piston and a plurality of shock absorbing pads that are alternatingly different.

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